ColorsEstimator program documentation

1. Presentation

In computing there are several color spaces, the best known is the RGB space, only this one is hardware dependent. Indeed scan the same thing with different brands of scanner and you will get different RGB values for the same “true” color.
However, there is another more objective color space, the “CieLab” space and it is the purpose of this software to measure the CieLab color of scanned objects.
Even humans are not objective about color, depending on the eyes of people the colors seen are different, so this software is all the more interesting to give an objective opinion on colors.
To switch from the hardware-dependent color space (RGB) to the hardware-independent color space (CieLab) you need a small file called “ICC Profile” which depends on the machine, therefore the scanner. To create this file, we scan a color chart (piece of cardboard with colored squares called “patches”). The CieLab colors of the patches are known and given by the vendor of the chart in a file named "CGATS file".

By scanning this color chart my software will find the correspondence between the measured RGB colors and the true theoretical CieLab colors. He will thus be able to create the ICC profile (which contains this correspondence). Then by scanning a new object and assigning the ICC profile to it, again thanks to my software, we can estimate the CieLab colors of a rectangle that we choose (a rectangle and not a point because I average the CieLab values of each point of the rectangle to avoid noise). I say estimate because a scanner will always be less powerful than a spectrophotometer (which does precisely this job) but a spectrophotometer is much more expensive (around 300 euros).

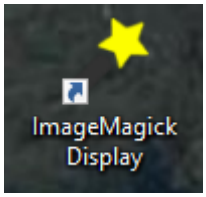
2. Third party software included in this software

I would like to point out that I used two third-party free and open-source software that are integrated into this software, otherwise this software would never have been done:

- Argyllcms : for color chart recognition and ICC profile creation
- ImageMagick : for various image operations including reading CieLab values

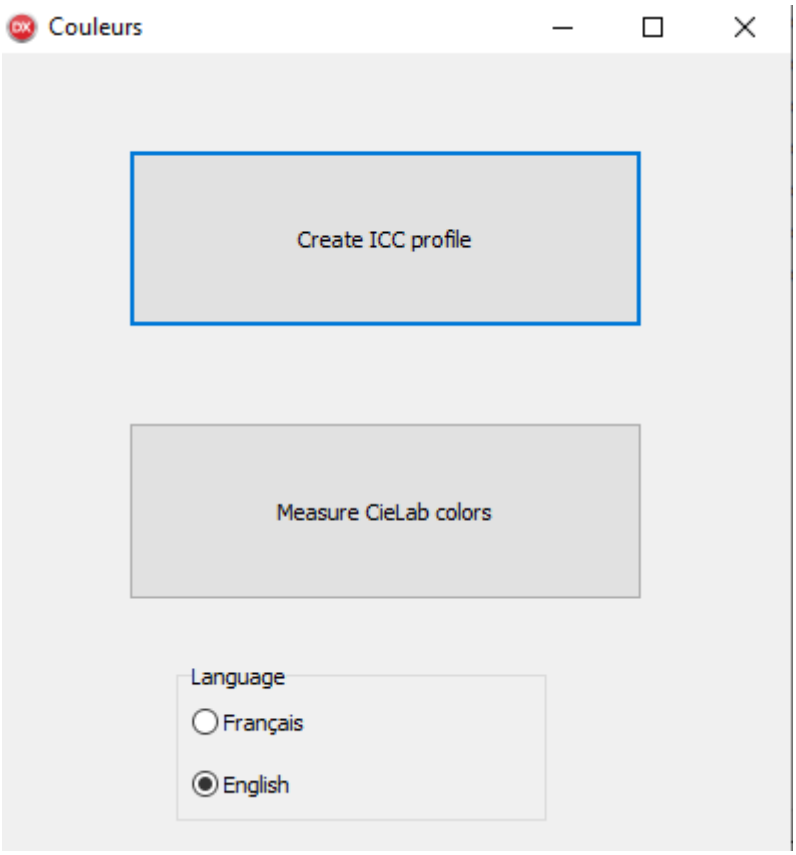
3. Installation

Before installing ColorsEstimator check that you do not have any versions of ImageMagick installed. To do this, go to "Control Panel / Programs and Features" and uninstall any version of ImageMagick. ImageMagick is indeed installed with ColorsEstimator and the various versions may conflict. Once the ImageMagick versions have been uninstalled, restart the computer, then delete the "ImageMagick" folders in "C:\Program Files". You can then install ColorsEstimator by double-clicking on “ColorsEstimator_English_Setup.exe” and doing “Next/Next”. Attention ! under Windows 10 and 11 a warning window is displayed, it is that Sylvain Ard did not pay for a certificate to sign his program but it is guaranteed virus-free, then do "Additional information / Run anyway". Wait for the Image Magick icon below to appear, this is a sign that the installation is complete.



4. Home screen

When the program starts, this home screen is displayed:



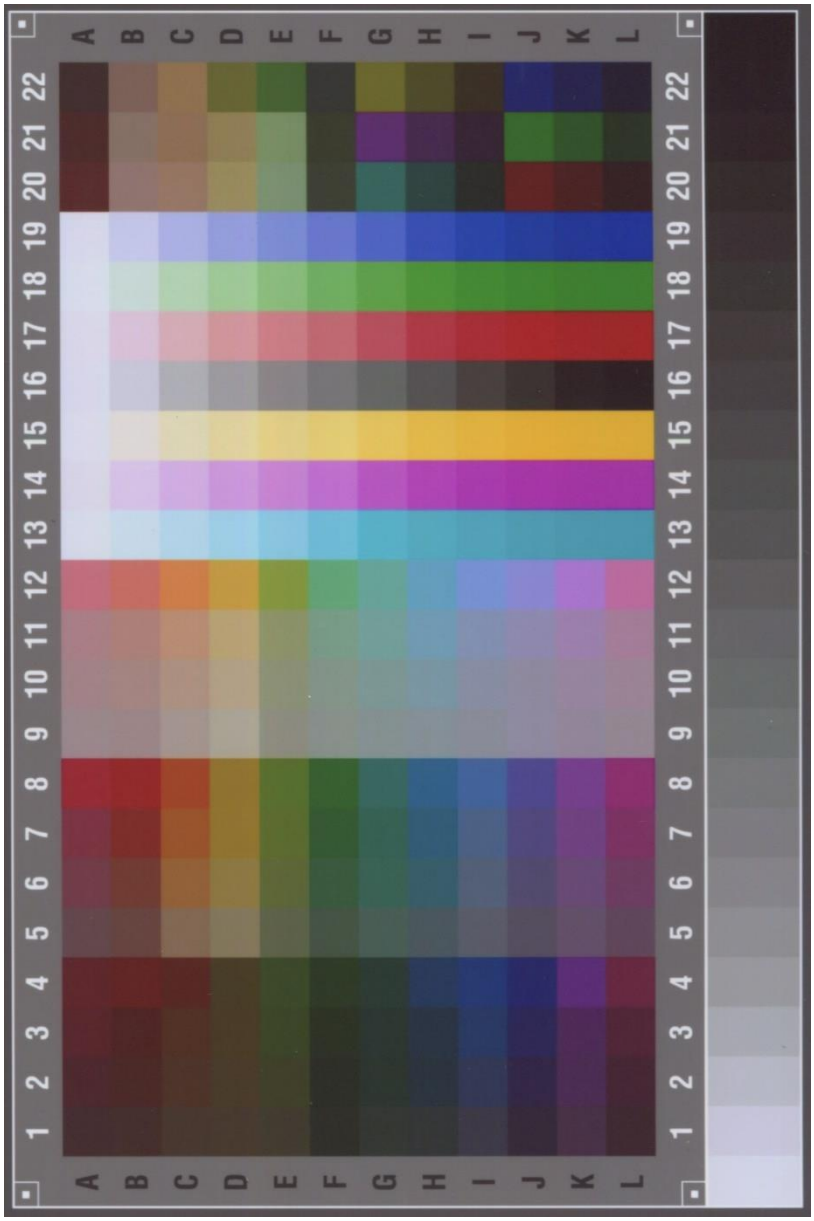
Here you can choose to create an ICC profile or measure CieLab colors on a new image. You can also choose the language: Français (= French) or English.

5. Create the ICC profile

Once you have clicked on “Create ICC profile” you arrive on a new page allowing you to create the ICC profile. You will need to buy a color chart, there are different types of color charts of different qualities and whose prices vary from a few tens of euros to a few hundred euros. I recommend the IT8.7/2 sights which are not expensive (about thirty euros) and nevertheless effective.

I bought it on this site: https://www.greywhitebalancecolourcard.co.uk/it8.html. Then choose “IT8.7/2 Fuji paper”. Do not take the "transmissive" because they are for slide mode. The first step is to scan the color chart. To scan the chart, put it straight on the glass of your scanner. Clean the glass of your scanner first to avoid color artifacts. Take note of your scanner settings as they should be the same when you measure CieLab colors with the ICC profile generated at this step. I advise you to scan the target and the objects you will scan with an aluminized blanket covering the scanner to avoid incident light which distorts the results. To find an aluminized blanket you can go to Amazon and take for example an aluminized survival blanket. The color chart must be scanned in TIF and 300 DPI. If your scanner does not allow it you will not be able to use the software without buying another one. On this subject, I recommend the Epson V370 Photo, good value for money.Une fois la mire scannée ouvrez l’image en cliquant sur le bouton « Parcourir » en face de « Fichier TIF de la mire ».

The next step is to crop it (hence the importance of scanning it straight). To do this, play with the zoom slider above the pattern image in the software to see the entire pattern. Then click first on the top left edge then on the bottom right edge of the pattern without the writing around it. This draws a rectangle. If the rectangle suits you, click on “Reframe” otherwise redraw a rectangle. You should get something like this:



It's okay if there are a few unwanted pixels around, the software takes care of it.

The next step consists in specifying to the program the CGATS file which is a file provided by the vendor of the color chart and which contains the CieLab values of the different patches of the chart. On https://www.greywhitebalancecolourcard.co.uk/it8.html you will find it by going to the very bottom of the site and clicking on “IT8 Color Target reference data files”. You will then download an it8_data.zip file that you will need to unzip. Then go to the "Refective" sub-folder and the correct CGATS file is the one whose number is on the chart opposite "Data file".

In the "Color chart type" drop-down box, specify "it8" (if your pattern is an IT8.7/2) this is important so that the software can recognize the correct patches. Then in "CGATS file of the color chart" click on "Browse" and open your CGATS file.

Note that for some charts the CGATS file is known in advance as "ColorChecker" and the CGATS file will then be pre-selected without you having to search for it.

Then once the color chart type is selected, the CGATS file is specified and the color chart image is opened and cropped, click on “Recognize pattern”. Normally the patch numbers are then displayed on a copy of the pattern image in the "Autodetected Pattern Image" panel. You can check if the numbers correspond to the patches, otherwise there is no need to go further.

Once the pattern is recognized, click on "Create the ICC profile" to create the ICC profile, this launches an MS-DOS window for the operation. Wait until the operation is complete, after that if everything worked a "Save as" window is opened to save the ICC profile. Save the ICC profile somewhere you can easily find it and with a meaningful name.

The entire ICC profile generation operation must be renewed once a month because the scanner is aging and its lamp does not recognize colors in the same way.

Once you have the ICC profile in hand, you can move on to the next step of CieLab color measurement.

If you close this window you return to the home screen.

6. Measure CieLab colors

This section assumes that you have an ICC profile created by the previous section.

To measure the CieLab colors of a rectangle of an image, the first thing to do is to select the image. To do this, click on "Browse" in front of "TIF image" and select the image to be measured. ¨Then go find the ICC profile by clicking on “Choose the ICC profile”. Then draw a rectangle on the open image by clicking first on the upper left corner then on the lower right corner of this rectangle in the image. Finally click on “Calculate the average of the CieLab values of the selected rectangle”. This opens a new window on which the three channels of the CieLab value are displayed, namely L*, A* and B*. You can check the validity of the software by opening the chart scan and measuring the CieLab color of a patch, you can then compare this value with the theoretical value of the CGATS file (which is a simple text file that you can open with Notepad). If you find a difference greater than 10, there is a problem, then contact me as indicated in the “Bugs and contact” section. If the difference is less than 10, it is part of the normal error of the software which is inherently inaccurate. Test if possible on several patches.

If you close this window you return to the home screen.

The program closes only if you close the welcome screen. Never open the program in multiple copies as it may malfunction.

7. Bugs and contact

If you find a bug in the software, please send me the scan of the color chart, the CGATS file and the type of color chart to sylvain.ard@gmail.com specifying the bug discovered.